Pain Profiles and Psychosocial Distress Symptoms in Workers with Low Back Pain

Nomusa Mngoma, Marc Corbière, Joan Stevenson

ABSTRACT

Purpose: The current study investigated the pain profiles of patients with subacute non-specific low back pain attending an outpatient return-to-work rehabilitation programme. Differences in symptoms of distress (depression and anxiety) and return to work between the pain-profile groups were assessed.

Methods: Sixty-five volunteers who met the eligibility criteria and had complete follow-up data were included in the analysis. The mean age was 38.8 years (minimum 18, maximum 64); 38 (58.5%) were men. The median time since onset of low back pain was 30 days. Cluster analysis was used to categorize patients into groups according to pain severity scores (VAS).

Results: Two distinct clusters—severe pain and moderate pain—emerged. There were significant differences in depressive and anxiety symptoms between the pain profiles. Further, return-to-work rates varied significantly between the two groups (31% in the severe pain cluster compared to 90% in the moderate pain cluster).

Conclusion: Although both groups showed significant improvements in depression and anxiety symptoms over time, the severe pain cluster scored higher at discharge (higher scores indicating worse outcomes). These results highlight the importance of early identification of sub-groups at risk so that rehabilitation interventions can be focused with the goal of minimizing long-term disability.

Key Words: anxiety, back pain, depression, psychosocial distress, return to work

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RÉSUMÉ

Objet : Cette étude a investigué les profils de douleur chez les patients atteints de lombalgie subaiguë non spécifique inscrits à un programme externe de réadaptation pour le retour au travail. Les divergences dans les symptômes de détresse (dépression et angoisse), et le retour au travail, entre les groupes de profils de douleur ont été évaluées.

Méthodologie : Soixante-cinq bénévoles qui satisfaisaient aux critères d'admissibilité et avaient des données de suivi complètes ont été inclus dans cette analyse. L'âge moyenne était de 38,8 ans (minimum 18, maximum 64). Trente-huit (58,5 %) étaient des hommes. La médiane de temps écoulé depuis le début de la lombalgie était de 30 jours. L'analyse de groupement a été utilisée pour catégoriser les patients en groupes selon les scores de gravité de la douleur (EVA).

Résultats : Deux groupements distincts ont émergé, douleur profonde et douleur moyenne. Il y avait des différences significatives dans les symptômes de dépression et d'angoisse entre les profils de douleur. De plus, les taux de retour au travail variaient considérablement entre les deux groupes (31 % parmi le groupement atteint de douleur profonde en comparaison de 90 % parmi le groupement atteint de douleur moyenne).

Conclusion : Bien qu'avec le temps les deux groupes aient démontré une amélioration importante en ce qui a trait aux symptômes de dépression et d'angoisse, le groupement atteint d'une douleur profonde a obtenu un score plus élevé au congé (les scores plus élevés représentaient de moins bons résultats). Ces résultats soulignent l'importance de l'identification hâtive des groupes à risque pour que les interventions de réadaptation soient axées sur l'objectif de minimiser l'invalidité de longue durée.

Mots clés : angoisse, mal de dos, dépression, détresse psychosociale, retour au travail

Nomusa Mngoma, PT, PhD: Providence Care, Kingston, Ontario.

Marc Corbière, PhD: Professor/Researcher, Université de Sherbrooke, Sherbrooke, Quebec.

Joan Stevenson, PhD: Professor, Department of Physical and Health Education, Queen's University, Kingston, Ontario.

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Conflict of interest: None

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Address correspondence to *Nomusa Mngoma*, Physical Medicine and Rehabilitation Program, 340 Union Street, Kingston, ON K7L 5A2 Canada; Tel: (613) 548-7222 x2358; Fax: (613) 544-1023; E-mail: mngoma@queensu.ca.

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BACKGROUND

Low back pain (LBP) is one of the leading causes of disability in working-age adults in industrialized countries.[1] For example, it is estimated that nearly 80% of the population in the United States and Canada will experience significant LBP at least once in their lifetimes.[2] Treatment of LBP that is significant enough to interfere with work continues to pose a challenge to rehabilitation professionals, since some patients seem to improve while others do not. Although the majority of those with uncomplicated soft-tissue injuries (about 80–90%) will recover within the first three months, it is the small percentage (3%–10%) of individuals who progress to longer-term disability who are responsible for a large proportion of costs.[3,4]

Psychological factors (distress, depression, and pain-related anxiety) have been associated with LBP and pain-related disability, including failure to return to work (RTW).[5–7] In a recent study of 232 patients from 40 physiotherapy clinics, approximately 40% of patients with non-specific LBP had depressive symptoms.[8] In a study of 685 patients with chronic LBP,[9] significantly higher levels of depressive and anxiety symptoms were found in the patient group than in a representative sample of the adult non-patient population.

The association between the probability of RTW and depression profiles in persons with pain of musculoskeletal origin has been reported previously.[10] A greater proportion of participants in the milder depression categories (61% to 85%) than in the moderate and severe depression categories (18% to 21%) returned to work.[10] Similarly, Vowles et al.[7] found that depression was one of the main factors strongly associated with RTW status after treatment in a sample with chronic pain.

Recently, patient profiles have been used to attempt to identify groups of patients who will likely continue to long-term disability.[4,11] Using cluster analysis in a study of patients with acute or chronic subacute back pain, Boersma and Linton[4] identified four distinct patient profiles. Of the four profiles, patients in clusters with higher pain-related fear and depressed mood reported more difficulty with RTW during follow-up compared to low-risk groups. The highest proportion (62%) of participants who had been on sick leave for more than 15 days during the year between treatment and follow-up were those with highest scores on all variables (pain, pain-related fear, and depressed mood).[4]

Tailored interventions targeting specific psychological issues early in the rehabilitation process are needed to prevent transition to persistent/chronic pain and thus reduce long-term disability.[11,12] Identification of at-risk sub-groups within clinical populations is an important first step in adjusting interventions to meet patient needs.[4] The influence of psychological factors on RTW has far-reaching consequences for the patient, his or her family, and society at large. In the present study we investigated pain profiles in patients with LBP, differences in depression and anxiety symptoms between different profiles, and how these related to RTW at programme completion.

The objectives of the current study were (1) to determine patient profiles according to pain in a clinic population with LBP, (2) to determine differences in depression and anxiety symptoms over time between these profiles, and (3) to determine the association between patient profiles and RTW at programme completion.

METHODS

The Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board approved the study and all related procedures. All participants provided informed consent.

Study Participants

The study took place in a hospital-based general outpatient physiotherapy clinic. All patients recruited for the study were receiving workers' compensation benefits. Inclusion criteria for this study were (1) referral for treatment of work-related LBP, (2) an approved Workplace Safety and Insurance Board claim, (3) ability and willingness to attend treatment sessions, and (4) good command of English. Exclusion criteria were (1) back pain that resolved in less than three visits, (2) presence of serious pathology, such as vertebral fracture or tumour; and (3) cauda equina involvement.

Of 180 consecutive patients with LBP who reported to the clinic for physiotherapy and were considered for the study, 147 met the eligibility criteria and were enrolled.

Study Design

A before-and-after study design was used, with data collected at Time 1 and Time 2 (on admission to and discharge from the programme, respectively). Sixty-five participants with complete Time 1 and 2 data (completers) were included in the current analysis. The mean age of the completers was 38.8 years, with a minimum and maximum age of 18 years and 64 years, respectively; 38 (58.5%) were men. Time 2 data were completed at discharge. Patients who failed to return for their final appointment were contacted by telephone on two separate occasions. All patients who failed to respond to the two follow-up reminders (non-completers) were therefore discharged from the study.

Programme Description

All patients participated in a RTW rehabilitation programme of standard physiotherapy tailored to

individual needs. The core components of the programme included an initial assessment, exercise prescription (typically strengthening, stretching, and pool exercise), education, and reassurance. The overall goals of the programme were to facilitate RTW and to prevent pain-related disability. The median length of stay in the programme was similar for completers (56.0 days) and non-completers (56.5 days).

Measures

Pain

Pain intensity was assessed using a horizontal 100-mm visual analogue scale (VAS).[13–15] The extreme limits of this line were marked with short perpendicular lines that denoted absence of pain at one end and the highest possible intensity of pain at the other; the words ''no pain'' and ''unbearable pain'' defined these anchor points.[15] Participants were asked to mark the VAS at the point that corresponded to their pain intensity. The magnitude of pain was estimated by measuring the distance between the ''no pain'' anchor of the scale and the mark provided by the participant. The pain VAS has been shown to have good validity and reliability when its psychometric properties were examined in a systematic review,[16] with pooled coefficients reported in the systematic review ranging from 0.73 to 0.80 for test–retest reliability.[16] The pooled value for construct validity was 0.82.[16]

Depression and Anxiety Symptoms

Two sub-scales representing the Depression and Anxiety symptom dimensions of the Brief Symptom Inventory (BSI, registered trademark of Leonard R. Derogatis, PhD) were used to monitor changes in symptoms of psychological distress. The BSI is a 53-item self-report inventory designed to reflect psychological symptoms in patient and non-patient populations.[17] In addition to three general distress measures, the BSI has nine sub-scales or symptom dimensions.[17] The Depression sub-scale is made up of BSI items 9, 16, 17, 18, 35, and 50; the Anxiety sub-scale is made up of BSI items 1, 12, 19, 38, 45, and 49. A number of psychosocial ''problems'' are listed on the BSI, and the question ''How much has that problem distressed or bothered you during the past 7 days including today?'' is asked relative to each of these problems. The response options available range from 0 (has bothered me not at all) to 4 (has bothered me extremely).[18] Scores for each sub-scale are obtained by adding the values for each item and then dividing the sum by the number of items endorsed.[18] The BSI was chosen for its brevity and ease of scoring: the BSI takes approximately 8 to 10 minutes to complete and can be scored without the services of a psychologist.

The BSI has demonstrated good psychometric properties.[18] Reported test–retest reliability coefficients vary from 0.68 for the Somatization dimension to 0.91 for the Phobic Anxiety dimension.[18] A Cronbach's alpha coefficient of 0.87 has been reported for the Depression and Anxiety sub-scales.[19] The BSI has shown good convergent construct validity with the Minnesota Multiphasic Personality Inventory (MMPI), with correlations of 0.72 and 0.57 for Depression and Anxiety sub-scales respectively.[18]

Return to Work

Patients were asked whether or not they were working at the time of data collection (admission and discharge). Response options were ''Yes'' or ''No.'' Those who had returned to work were also asked whether they had returned to regular or to modified duties. The term ''regular duties'' was defined as the pre-injury level of work (prior work).

Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 12.0 (SPSS Inc., Chicago, IL). Independent *t*-tests and chi-square tests were used to determine whether there were statistically significant differences between completers and non-completers.

Cluster analysis, which uses algorithms and methods for categorizing objects of similar nature into previously unknown groups,[20] was used in this project. The *k*-means method of clustering, available in the SPSS statistical package, was chosen for use in the current analysis. In this type of cluster analysis, given a set number of clusters, observations are assigned to each cluster such that the means within a cluster are as similar as possible to one another and as different as possible from those in other cluster(s).[20] In the current study, cluster analysis was conducted using both Time 1 and Time 2 VAS pain-intensity scores, such that the clusters that emerged were distinct in terms of scores at both times. Cluster analysis has recently been used in a study of patients with acute and subacute neck, shoulder, and back pain.[4] Using a cluster-analysis method, clusters in the VAS scores were identified at Time 1 and Time 2 according to VAS intensity levels (high or moderate pain).

The next stage was to use a repeated-measures multivariate analysis of variance (MANOVA) in order to identify whether clusters were significantly different in terms of depression and anxiety symptoms over time. The dependent variables were the Depression and Anxiety sub-scales of the BSI, and the independent variables were pain-intensity cluster and time of measure. The critical *p*-value was set at 0.05. Finally, chi-square tests were used to determine whether there were significant differences in the RTW rates of participants in the VAS clusters. Only one level of the RTW responses (i.e., ''RTW: Yes/No'') was used in the current analysis.

Table 1 Comparison of Completers versus Non-completers on Gender, Age, Time Post Onset, and Length of Stay

	Completers	*Non-Completers*
Participants *n* (%)	65 (44.2)	82 (55.8)
Gender		
Male *n* (%)	38 (58.5)	50 (61.0)
Female *n* (%)	27 (41.5)	32 (39.0)
Age in years mean (SD)	38.9 (10.1)	40.2 (9.4)
Median time since onset in days	29.0	32.0
Median length of stay in days	56.0	56.5

Table 2 Comparison of Completers versus Non-completers on Admission Pain, Depression, and Anxiety Scores

	Completers Mean (SD)	*Non-completers Mean (SD)*	*Significance (2-tailed)*
Pain VAS (Time 1)	5.40 (1.70)	5.10 (2.00)	$p = 0.51$
BSI Depression (Time 1)	0.59 (0.72)	0.51 (0.62)	$p = 0.46$
BSI Anxiety (Time 1)	0.66 (0.64)	0.71 (0.61)	$p = 0.68$

VAS = visual analogue scale; BSI = Brief Symptom Inventory[18]

RESULTS

Sixty-five patients provided complete pre-test and post-test data (completers) and were included in the current analysis. The mean age of participants completing the study was 38.8 years (minimum 18 years, maximum 64 years); 38 (58.5%) were men. Table 1 provides detailed information on the comparisons between the two groups. Statistical analyses revealed no significant differences ($p > 0.05$) between completers and non-completers. The median time since onset of LBP for the group was 30 days.

Patient Profiles Based on Pain Intensity

Independent *t*-test comparisons of completers and non-completers showed no significant differences between the two groups on key variables such as age ($t = 0.80$, df = 145, $p = 0.42$), time since onset of back pain ($t = -0.14$, df = 145, $p = 0.89$), and length of stay in the programme ($t = 0.61$, df = 145, $p = 0.55$). Independent *t*-tests revealed no statistically significant differences in baseline pain ($t = -0.65$, df = 135, $p = 0.51$), depressive symptoms ($t = -0.73$, df = 140, $p = 0.46$), or anxiety symptoms ($t = 0.41$, df = 140, $p = 0.68$) between the two groups. Means and standard deviations are given in Table 2. There were no differences in the proportions of men and women between completers and non-completers ($\chi^2 = 0.10$, df = 1, $p = 0.76$). As well, chi-square tests revealed no statistically significant differences in work status between the two groups, either at baseline ($\chi^2 = 2.25$, df = 1, $p = 0.13$) or at discharge ($\chi^2 = 1.49$, df = 1, $p = 0.22$); most participants in each group (78.5% of completers, and 69.5% of non-completers) had returned to work at discharge.

Pain profiles were examined leading to the identification of two clusters based on perceptions of pain intensity at Times 1 and 2. The clusters that emerged, severe pain ($n = 13$) and moderate pain ($n = 52$), were then used to determine whether there were any distinguishable differences in participants' levels of self-reported depressive and anxiety symptoms based on cluster of pain severity (see Figure 1). The scores established by the pain VAS confirmed these two profiles (a score higher than 5 indicates a high level of pain intensity). Regardless of the pain-intensity profile, mean scores for both groups improved over time (see Figure 1).

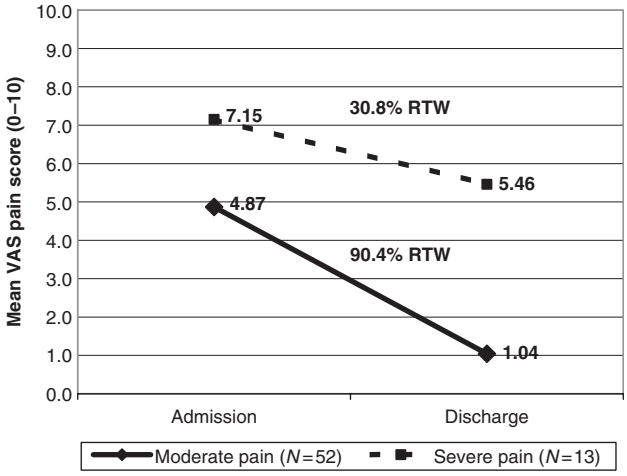

Figure 1 Moderate and severe pain profiles at admission (Time 1) and discharge (Time 2) and percentage of return to work

Differences in Depression and Anxiety Symptoms

A repeated-measures MANOVA was carried out on the Depression and Anxiety sub-scales of the BSI by considering the two pain profiles: severe pain intensity ($n = 13$) and moderate pain intensity ($n = 52$). Individuals with moderate pain intensity scored significantly lower on both BSI sub-scales than those with severe pain intensity (see Figures 2 and 3). Mean, SD, and mean difference values are shown in Table 3. Tests of between-subject effects (repeated-measures MANOVA) indicated significant *F*-values of 4.12 to 7.17 (df = 1, 63, $p < 0.050$) for the depression and anxiety sub-scales respectively (as shown in Table 4). Furthermore, tests of within-subject contrasts (time effects) revealed that, regardless of the pain-intensity cluster, levels of depression and anxiety were lower at Time 2 ($F = 15.95$ and 22.71, df = 1, 63, $p < 0.001$) as measured by the BSI Depression and Anxiety sub-scales (see Table 4). The Wilks' lambda *F*-values for between-subjects effects and within-subject contrasts were 3.79 ($p = 0.028$) and 11.26 ($p = 0.001$) respectively. Figures 2 and 3 further illustrate these results, showing not only that pain intensity was related

to depression and anxiety symptoms but also that depression and anxiety symptomatology improved over time in all individuals. No interaction effects were found in the analyses.

Patient Profiles and Return to Work

The rate of RTW among the total sample was high, with 78.5% of the sample back at work by programme completion. However, chi-square tests showed that participants in the severe pain cluster had significantly more difficulties with RTW (30.8% of the cluster) than those in the moderate pain cluster (90.4% of the cluster) ($\chi^2 = 21.87$, df = 1, $p = 0.001$).

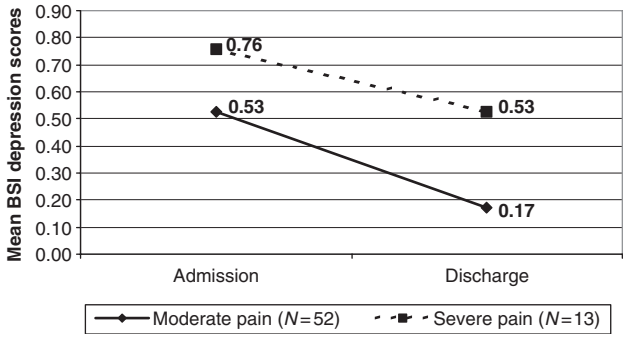

Figure 2 Profiles of moderate and severe pain clusters according to Brief Symptom Inventory Depression sub-scale scores at admission (Time 1) and discharge (Time 2)

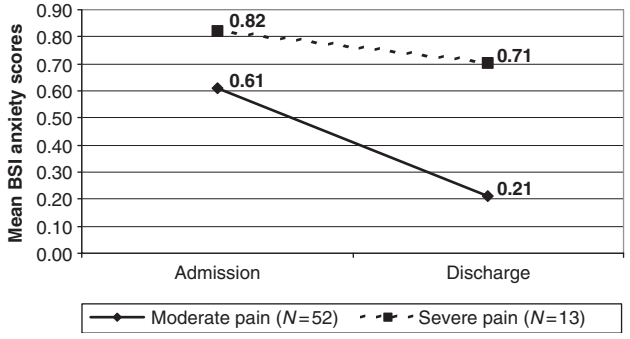

Figure 3 Profiles of moderate and severe pain clusters according to Brief Symptom Inventory Anxiety sub-scale scores at admission (Time 1) and discharge (Time 2)

DISCUSSION

The aims of the present study were to identify pain profiles in a LBP clinic patient population and to determine differences in depression and anxiety symptoms between the profiles. We also aimed to determine how the patient profiles related to RTW at programme completion. Our results show that the two pain profiles that emerged from cluster analysis—severe pain intensity and moderate pain intensity—were significantly different in terms of depression and anxiety symptoms: patients in the severe pain cluster had higher depressive and anxiety symptom scores than patients in the moderate pain cluster. There were significant improvements over time in both depressive and anxiety symptom scores; interestingly, however, depression and anxiety symptom scores for patients in the severe pain cluster remained higher than those for patients in the moderate pain cluster, even at programme completion. Similar trends have been observed previously. For example, Sullivan et al.[21] found that in a group of injured workers with mild and moderately severe depressed mood, those in the latter group were more likely than the mildly depressed group to score in the depressed range post-treatment, although both groups improved.

In the current study, the overall RTW rate in the two clusters combined was fairly high (78.5%). When each cluster is considered separately, however, we find that only 31% in the severe pain cluster had returned to work at programme completion, compared to 90% in the moderate pain cluster. These RTW rates are comparable to, if slightly higher than, those reported by

Table 3 Time 1 and Time 2 Mean and Standard Deviation Scores by Pain Cluster for Pain VAS, BSI Depression Sub-scale, and BSI Anxiety Sub-scale

	Moderate Pain Intensity Mean (SD)			*Severe Pain Intensity Mean (SD)*		
	Time 1	*Time 2*	*Mean Difference* ($\bar{d}$)($SD_{\bar{d}}$)	*Time 1*	*Time 2*	*Mean Difference* ($\bar{d}$)($SD_{\bar{d}}$)
Depression sub-scale	0.53 (0.67)	0.17 (0.25)	0.36 (0.61)	0.76 (0.93)	0.53 (0.66)	0.23 (0.78)
Anxiety sub-scale	0.61 (0.57)	0.21 (0.25)	0.41 (0.60)	0.82 (0.78)	0.71 (0.69)	0.12 (0.62)

Table 4 Repeated-Measures MANOVA: Tests of Between-Subject Effects and Within-Subject Contrasts

	Source	*Measure*	*F*	*p*
Between-subject effects	Pain cluster	Depression sub-scale	4.12	0.047
		Anxiety sub-scale	7.17	0.009
Within-subject contrasts	Time	Depression sub-scale	15.95	0.001
		Anxiety sub-scale	22.71	0.001
Interaction	Time*Pain cluster	Depression sub-scale	0.36	0.55
		Anxiety sub-scale	2.49	0.12

Corbière et al.;[10] in that study, 61% to 85% of participants with mild or no depression returned to work, while those with higher levels of depression had greater difficulty, only 18% to 21% returning to work. The differences between these studies could likely be attributed to the fact that patients in the current study were in the subacute phase of LBP, whereas those in Corbière et al.'s[10] study were in the chronic phase. Similarly, in a large multinational comparative study, Hansson and Hansson[22] reported that pain intensity was one health-related measure that predicted RTW in all countries. In another study of patients with long-term LBP, Vowles et al.[7] reported significant associations between pain intensity and RTW and between depression and RTW. Similarly, in the present study, those in the severe pain cluster had higher depression scores both before and after treatment and achieved lower (31%) RTW rates post-treatment. However, the relationship between anxiety (measured with the Pain Anxiety Symptom Scale) and return to work was not statistically significant in the Vowles et al. study.[7]

The results of the present study confirm previous reports on associations between psychological factors (depressive and anxiety symptoms) and pain severity, on the one hand, and RTW, on the other. The perception of pain is a complex phenomenon, subject to many physical and psychological influences. It is possible that the same factors influencing pain perception could have influenced the self-rating of depression and anxiety; for instance, the influence of RTW on the perception of pain intensity and reports of depressive and anxiety symptoms was not examined in the current study. It is possible that individuals in the moderate pain cluster had more favourable reports of pain and symptoms of distress because the majority had returned to work.

Several limitations of this study are worth noting. One was the small size of the subset with complete pre- and post-rehabilitation-programme data. While this may have affected the ability to detect differences, statistically significant improvements were nevertheless found across time in reported pain severity, depressive symptoms, and anxiety symptoms. The validity of the current study may have been compromised, and results may not be generalizable to other patients with LBP, because of high loss to follow-up and small sample size. Return to work after injury is a complex process influenced by a number of factors, including the clinical interaction between patient and provider and workplace factors such as availability of modified work.[23] It is quite possible that RTW in this study was as much a function of patient–clinician interaction as of other factors. In addition, a third measurement point at a later time after discharge might have been able to show whether the trends observed would continue 6 or 12 months after discharge. Another limitation concerns the issue of RTW, which, in this study, was measured as ''yes'' or ''no'': it is probable that the results might have been different had time to RTW been measured instead. However, previous studies using similar RTW measures have observed similar relationships with psychosocial distress and pain.

CONCLUSION

Distinct patient profiles were identified in a sample of injured workers with subacute LBP, with those reporting severe pain intensity also reporting higher depressive and anxiety symptoms both before and after treatment. This study highlights the importance of early identification of psychological factors as well as the need to focus interventions to address these factors, particularly for those at higher risk for transition from subacute to persistent pain and long-term disability. For instance, it would be possible to integrate psychological interventions within a RTW rehabilitation programme.

KEY MESSAGES

What Is Already Known on This Subject

Pain-intensity scores can be used to provide clinicians with valuable information, such as documenting change over time. The relationship between pain-intensity scores and depressive and anxiety scores in patients with low back pain (LBP) has been demonstrated in other studies. The notion that patients with subacute LBP do not form a homogeneous group has recently been explored. Subgroup analysis, therefore, appears to be a promising approach in the area of non-specific LBP research.

What This Study Adds

Distinct sub-groups may exist within samples of patients with subacute LBP. Although improvement in pain-intensity scores is a general expectation of both clinicians and patients, our findings suggest that there are differences in response to the rehabilitation process and that these differences are identifiable using pain-intensity scores. We have shown that patients reporting higher pain scores at admission also reported higher scores at discharge compared to their lower pain-scoring counterparts and showed a smaller degree of change. The same trend was observed for depression and anxiety scores at admission and discharge. It may be important, therefore, to pay particular attention to patients' self-ratings of pain intensity on admission to rehabilitation programmes; these self-ratings may indicate how other scores, such as depressive and anxiety symptom scores, can be expected to vary, but they also may suggest how the patient is likely to progress in the rehabilitation process.

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